PICTORIAL KEYS

Cooperative ECONOMIC INSECT REPORT

Issued by

PLANT PEST CONTROL DIVISION
AGRICULTURAL RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

PLANT PEST CONTROL DIVISION

SURVEY AND DETECTION OPERATIONS

The Cooperative Economic Insect Report is issued weekly as a service to American Agriculture. Its contents are compiled from information supplied by cooperating State, Federal, and industrial entomologists and other agricultural workers. In releasing this material the Division serves as a clearing house and does not assume responsibility for accuracy of the material.

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Revised January 1963

ILLUSTRATED KEY TO SPECIES OF TROGODERMA AND TO RELATED GENERA OF DERMESTIDAE COMMONLY ENCOUNTERED IN STORED GRAIN IN CALIFORNIA

The keys which follow are partly original work and partly from three other sources: 1. Hinton, 1945; 2. Beal, 1954; 3. Howe and Burges, 1955. The adult characters distinguishing the species of Trogoderma are largely the work of Okumura. The larval key is by Blanc and the characters used are from Hinton and Beal except for particularly important characters defining granarium, which are from Howe and Burges.

References cited are:

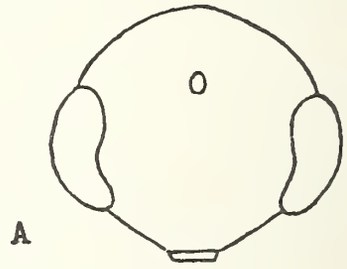
1. Hinton, H.E. Beetles Associated with Stored Products British Museum, 1945.
2. Beal, R. S. Jr., Biology and Taxonomy of the Nearctic Species of Trogoderma University of California Pub. in Ent., 10(2): 35-102, 1954.
3. Howe, R. W., and Burges, H.D., Trogoderma afrum Pr., a synonym of T. granarium and a comparison with T. versicolor. (In press).

To work the keys it is necessary to make microscopic dissections of adults and slide mounts of the larvae. Some of the drawings are diagrammatic and complete in detail only to the extent necessary.

A. ADULTS

1. Head with a median ocellus (A); species usually less than 5.5 mm. long.....2

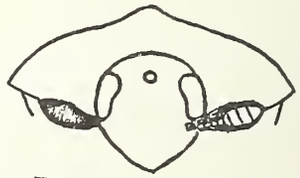
   Head without an ocellus; species usually 5.5-12 mm. long.....DERMESTES Linnaeus



A

2(1). Prothorax without cavities for the reception of the antennae or, if cavities are present, they are not visible from frontal view. Dorsal surface always hairy, only rarely with a few patches of scale-like hairs among normal hairs.....3

   Prothorax with cavities for the reception of antennae (B); dorsal and ventral surface clothed entirely with triangular or broadly oval scales .....ANTHRENUS Fabricius


B

3(2). Hind tarsi with basal segment as long or longer than second..TROGODERMA Berthold 4

Hind tarsi with basal segment much shorter than second (C).....ATTAGENUS Latreille

4(3). Greatest width of male genitalia more than 2/3 the length of aedeagus (D).....5

Greatest width of male genitalia less than 2/3 the length of aedeagus (E).....8

5(4). Tergite of first periphallic segment almost straight at middle of distal margin(F)..6

Tergite of first periphallic segment forming an angle at middle of distal margin (G) .....simplex Jayne

6(5). Width of bridge of male genitalia narrower than aedeagus at point where they cross each other (H).....7

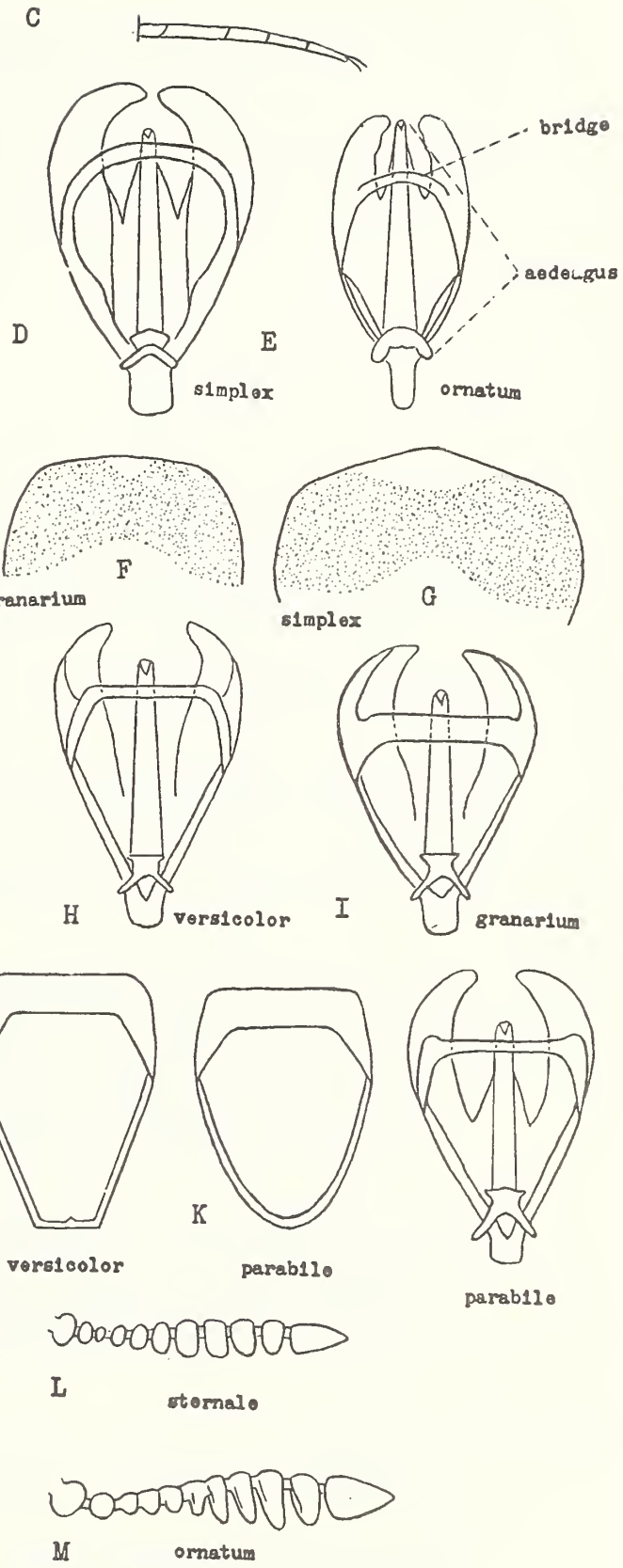
Width of bridge of male genitalia as wide or wider than aedeagus at point where they cross each other (I).....granarium Everts

7(6) Ninth abdominal segment or ring segment of male flattened ventrally (J); inner margin of eyes emarginated (A) versicolor (Creutzer)

Ninth abdominal segment or ring segment of male rounded ventrally (K); inner margin of eyes not emarginated.....parabile Beal

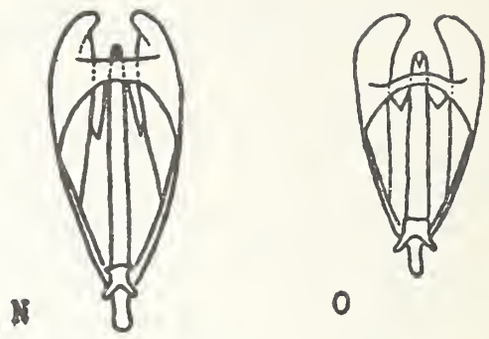
8(4). Third segment of male antenna minute, about 1/2 of either second or fourth segments in length and width; segments of club only moderately eccentric (L).....9

Third segment of male antenna approximating second and fourth segments in length and width; segments of club decidedly eccentric or pectinate (M)..ornatum (Say)



9(8). Median section of bridge between lateral lobes of male genitalia more or less straight (N).....sternale Jayne

Median section of bridge between lateral lobes of male genitalia arched (O) ..... grassmani Beal



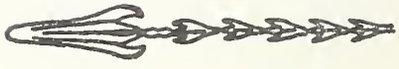
B. MATURE LARVAE

1. Urogomphi present on dorsum of 9th abdominal segment(A)..DERMESTES Linnaeus

Urogomphi absent.....2

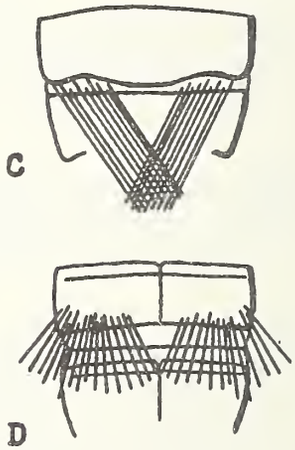
2(1). Hastisetae (spear-headed hairs) present on abdominal tergites (B).....3

Hastisetae absent.....ATTAGENUS Latreille



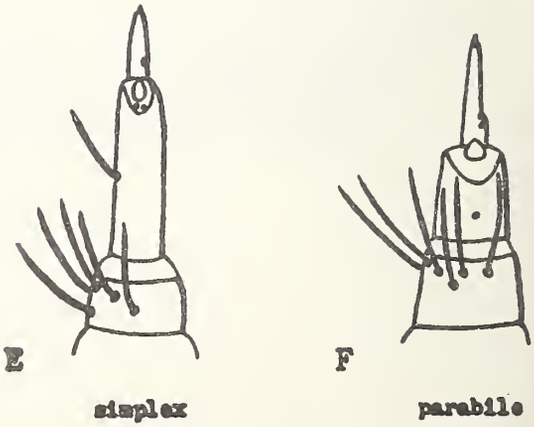
3(2). Tufts of hastisetae on abdominal tergites arising entirely from a membranous area on the caudo-lateral edge of segments; hastisetae from right and left sides usually converging over the cauda (C) .....ANTHRENUS Fabricius

Tufts of hastisetae on abdominal tergites arising from the sclerotized dorsal surface of the segments; hastisetae not obviously convergent over the cauda (D) .....TROGODERMA Berthold 4



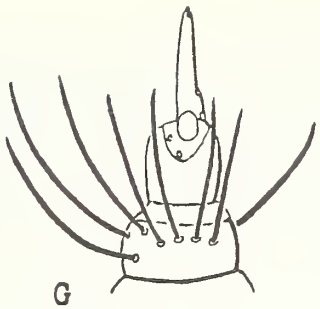
4(3). Second antennal segment 3 times length of 1st (E).....simplex Jayne

Second antennal segment less than twice length of 1st (F).....5



5(4). Setae of basal antennal segment arranged in a whorl, almost completely encircling the segment, setae not bunched on the mesal side of the segment (G).....6

Setae of basal antennal segment bunched on mesal side of segment, 1/3 or more of the outer portion of the segment bare (H).....7



G

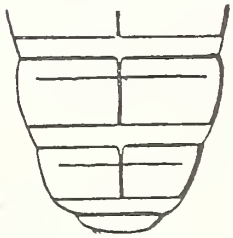
versicolor

H

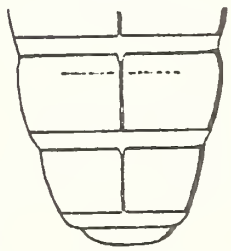
grassmani

6(5). Abdominal tergites 1 through 8 each bearing a transverse line (antecostal suture) near the anterior margin of the sclerotized area (I); 2nd antennal segment normally without setae (G) .....versicolor (Creutzer)

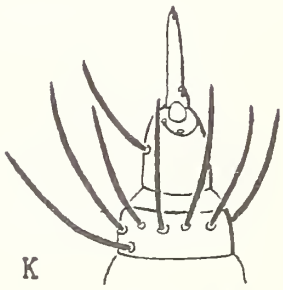
Abdominal tergites with antecostal suture on segments 1 through 6, but with suture faint or interrupted on 7th and usually absent on 8th (J); 2nd antennal segment with or without a seta (K) .....granarium Everts



I



J

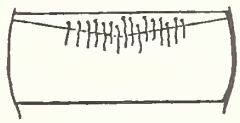


K

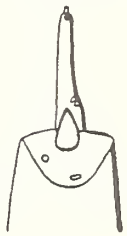
granarium

7(5). Setae of anterior portion (acrotergite) of 1st abdominal tergite all sufficiently long to extend caudad across the antecostal suture (L); accessory papilla of 2nd antennal segment extended distally into a sharp point (M).....8

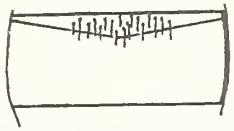
Setae of 1st abdominal acrotergite short, at least part of the more anterior setae not sufficiently long to cross the antecostal suture (N); accessory papilla of 2nd antennal segment rounded distally, not with a sharp point (O)&(F) .....parabile Beal



L



M



N

O

8(7). 2nd antennal segment without setae.....9

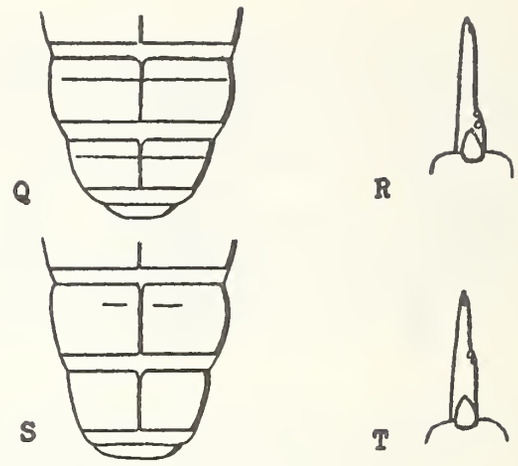
2nd antennal segment normally with one or two setae (P).....sternale Jayne

P

sternale

9(8). Antecostal sutures of 7th and 8th abdominal tergites extending completely across the tergites (Q); basal sensory pores of terminal antennal segment situated at about basal $\frac{1}{4}$ (R)&(H).....grassmani Beal

Antecostal sutures of 7th and 8th abdominal tergites not extending completely across the tergites, sometimes suture entirely absent on 8th segment (S); basal sensory pores of terminal antennal segment situated distad of basal 1/3 (T) .....ornatum (Say)



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(This is an illustrated revision of a previously issued unnumbered key released January 12, 1955, by the California Department of Agriculture)

NOTE: Trogoderma versicolor (Creutzer) is now T. inclusum LeConte according to R.S. Beal Jr. 1956. Ent. Soc. Amer. Ann. 49(6):559-566.

NOTES AND PICTORIAL KEY FOR SEPARATING KHAPRA BEETLE (TROGODERMA GRANARIUM) LARVAE FROM ALL OTHER NEARCTIC SPECIES OF THE GENUS

The accompanying pictorial key has been prepared in response to numerous requests for a method of rapidly distinguishing larvae of the khapra beetle (Trogoderma granarium Everts) from larvae of all other Nearctic species of the genus.

Mature unabraded and relaxed larvae are necessary for the dissection and study required to use the key effectively. Specimens preserved in 70 percent ethyl alcohol are best. Isopropyl alcohol is sometimes unsatisfactory.

Observations of the antennal setae and antecostal suture should be made with a magnification of approximately 45 diameters. The antennae should be extended for study by pressing on the thoracic region with the head of an insect pin or similar object. The resultant pressure forces the body fluids into the head capsule and extends the antennae.

For counting the papillae in the distal sensory cup of the epipharynx, a compound microscope with a magnification of approximately 440 diameters is recommended. The labrum must be dissected from the head capsule and turned ventral side up, placed on a slide in glycerine or in a permanent mountant, covered with a cover-slip and examined. If the papillae are not sufficiently clear, warming the slide slightly may improve visibility.

Occasionally the distal sensory cup is separated into two or three parts. If this condition exists, the total number of papillae will still be the same as given in the pictorial key.

All known Trogoderma larvae have six papillae in the distal sensory cup except the khapra beetle, Trogoderma granarium Everts, and Trogoderma glabrum (Herbst). These two species have four papillae in the distal sensory cup. Characters used in the pictorial key will separate granarium from glabrum.

The clumps of hastisetae on the seventh and eighth abdominal terga must first be removed to find whether the antecostal suture is present. This is easily accomplished by rubbing or gently scraping loose the hastisetae with an insect pin or similar object. After the hastisetae are removed, the posterior abdominal segments should be extended by gently applying pressure to the middle of the abdomen. This is necessary so that the intersegmental fold is not mistaken for the antecostal suture.

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Entomology Research Division
U. S. Department of Agriculture

PICTORIAL KEY FOR SEPARATING KHAPRA BEETLE (TROGODERMA GRANARIUM) LARVAE FROM ALL OTHER NEARCTIC SPECIES OF THE GENUS

setae of basal antennal segment almost completely encircling segment & extending to apex of second segment or beyond

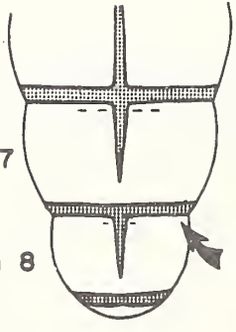
setae of basal antennal segment bunched on mesal side, not encircling & not attaining apex of second segment

Trogoderma spp. (NOT granarium)

distal sensory cup with four papillae

distal sensory cup with six papillae

Trogoderma spp. (NOT granarium)



terga uniformly creamy yellow to light brown

tergum 7

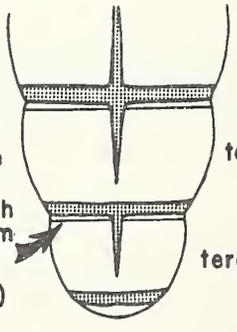
antecostal suture absent or feebly indicated on 8th abdominal tergum

tergum 8

(setae removed)

Trogoderma granarium Everts

terga dark gray



antecostal suture present, well developed on 8th abdominal tergum

tergum 7

tergum 8

(setae removed)

Trogoderma glabrum (Herbst)

AN ILLUSTRATED KEY FOR THE RECOGNITION OF THE IMPORTED FIRE ANT AND CLOSELY RELATED SPECIES

Prepared by Insect Identification and Parasite Introduction Laboratories, Entomology Research Division

The accompanying pictorial key is expected to help in the separation of major workers of the three kinds of fire ants known to occur in the area from North Carolina and Florida to Arkansas and Texas. The species involved are the native fire ants Solenopsis geminata (F.) and S. xyloni McCook, and the imported fire ant S. saevissima richteri Forel.

Within the area under consideration ants of the genus Solenopsis may be distinguished from those of other genera that build similar mounds by the extreme variation in the size of the individuals comprising a colony. They commonly range from 1/15 to 1/4 inch in length. Individual specimens of Solenopsis are characterized by a shiny body, a ten-segmented antenna having a prominent two-segmented apical club, two nodes (petiole and postpetiole) between the thorax and abdomen, and by the absence of paired spines on the posterior part of the thorax. An additional difference of no mean consequence is their ability to inflict painful stings.

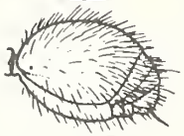
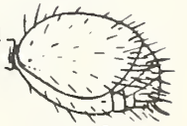
The largest (or major) workers offer the best taxonomic characters for the recognition of these species, and the key has been based on specimens of this caste. It must be noted that most characters vary from specimen to specimen and reliable use of this key requires study of a combination of characters. The key is not intended for use with a hand lens in the field.

An accurate mental picture of the species can be established most readily by comparison of correctly identified specimens. Such specimens may be obtained by submitting samples to State or Federal agencies concerned with the imported fire ant program with a request that identified specimens be returned. Additional information concerning biology and general characteristics of the imported fire ant may be found in the publication entitled "Observations on the Biology of the Imported Fire Ant" prepared by the Insects Affecting Man and Animals Research Branch, Entomology Research Division, ARS-33-49, issued in August 1958.

Collections of ants for which identifications are desired should be large enough to include about 10 or 12 major workers. Often it may be necessary to dig to considerable depth in the nest to secure workers. The specimens should be clean and undamaged. A good method of collecting is to let an ant run up a straw or small twig and then force it into a vial of 70 percent ethyl alcohol (formaldehyde is not a satisfactory preservative). If winged specimens or the large pupae are found in a colony, samples of them should be preserved in order to obtain important data on the biology of the species.

A label bearing complete information on locality, date, name of collector, and a notation regarding the habitat, i. e., cultivated field, pasture, woodland, marsh, etc., should be included in each vial of preserved specimens. Such labels should be legibly written on good quality paper with a moderately hard lead pencil. It is good practice to use code numbers corresponding to numbered field notes prepared in sufficient detail so that the collector can return to, or direct another person to the site of the nest from which the sample was collected.

AN ILLUSTRATED KEY FOR THE RECOGNITION OF THE IMPORTED FIRE ANT AND CLOSELY RELATED SPECIES

SOLENOPSIS GEMINATA (F.)	SOLENOPSIS XYLONI MCCOOK	SOLENOPSIS SAEVISSIMA RICHTERI FOREL
Carina on anterior margin of mesopleuron variously interrupted, the interruptions forming one or more tooth-shaped projections. 	Carina on anterior margin of mesopleuron continuous, not forming tooth-shaped projections. 	Carina on anterior margin of mesopleuron continuous, not forming tooth-shaped projections. 
Petiolar node narrow in profile, the posterior face forming a nearly straight line. 	Petiolar node broader at top, the posterior face forming a line that curves forward near apex. 	Petiolar node broader at top, the posterior face forming a line that curves forward near apex. 
Head extraordinarily large, obviously more than twice as broad as pronotum. See Fig. 1	Head not remarkably large, distinctly less than twice as broad as pronotum. See Fig. 2	Head not remarkably large, distinctly less than twice as broad as pronotum. See Fig. 3
Mandible sharply curved inward, the stronger curvature near middle of outer margin. See Fig. 1	Mandible less sharply curved inward, the curvature not stronger near middle of outer margin. See Fig. 2	Mandible less sharply curved inward, the curvature not stronger near middle of outer margin. See Fig. 3
	Antennal scape shorter, about as long as the distance from its base to a point half-way between the upper margin of the eye and the top of the head. See Fig. 2	Antennal scape longer, obviously longer than the distance from its base to a point half-way between the upper margin of the eye and the top of the head. See Fig. 3
	Biting edge of mandible with three teeth. 	Biting edge of mandible with four teeth. 
	Body generally more hairy, this condition especially apparent on disc of gaster. 	Body with fewer and more scattered hairs, this condition especially noticeable on disc of gaster. 
	Petiole with antero-ventral tooth or keel. 	Petiole without antero-ventral tooth or keel. 

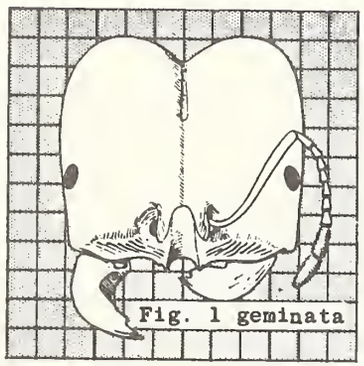


Fig. 1 geminata

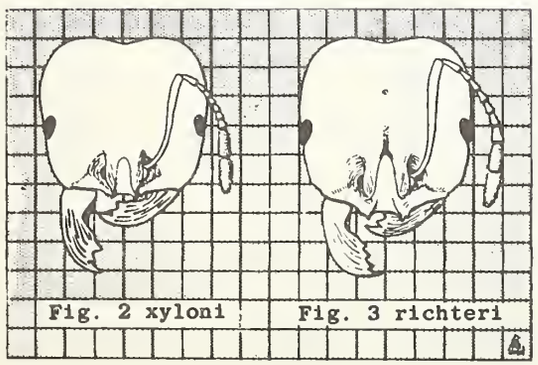


Fig. 2 xyloni | Fig. 3 richteri

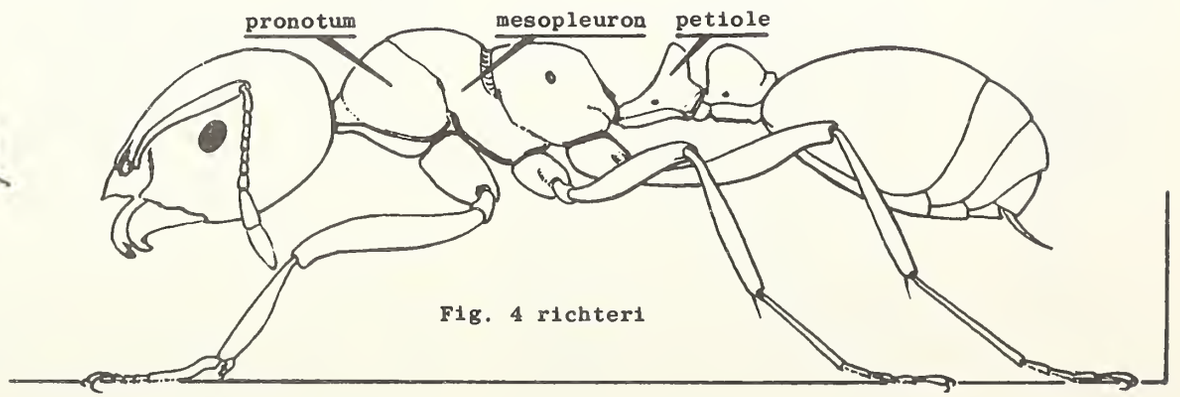


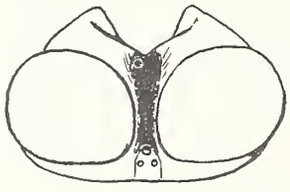
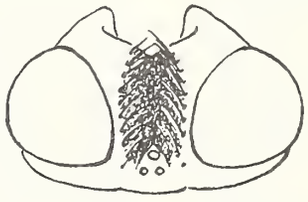
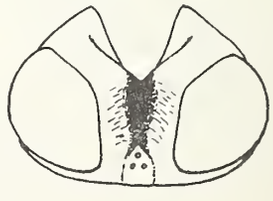
Fig. 4 richteri

Species of fire ants cannot be reliably distinguished by means of mound characteristics, as these depend largely on such factors as colony size and age, as well as upon the nature of the soil, and particularly on ground moisture conditions. Additional characters that are useful for separating xyloni and saevissima richteri, but which were omitted from the key because of space limitations, are as follows:

S. xyloni: The index number obtained by dividing the length of antennal scape by the distance between the eyes, ranging between 0.68 and 0.83 (these measurements to be made with an ocular micrometer, not judged by eye); sculpture on mesopleuron weak and, as a result, mesopleuron somewhat shiny; top of node of petiole and postpetiole usually without distinct longitudinal, finger-shaped impressions.

S. saevissima richteri: The index number obtained by dividing the length of antennal scape by the distance between the eyes, ranging between 0.85 and 1.0; sculpture on mesopleuron more obvious, the mesopleuron therefore not shiny; top of node of petiole and postpetiole with distinct longitudinal impressions, which are seen best in a posterodorsal view.

RECOGNITION OF SPECIES OF MUSCA

Musca domestica Linnaeus (house fly)	*Musca autumnalis* DeGeer ("face fly")
Both species with the familiar habitus of *Musca*: 4 black stripes on thorax, same wing venation, etc.	
Both sexes	
1. Typically slightly smaller, lighter in color; common indoors, on walls of stables, houses, etc., also found outside.	1. Typically slightly larger than *domestica*, and darker; an outdoor fly, on animals, especially about eyes and nostrils of cattle, or sitting on nearby rocks, fence-posts, etc.; may be indoors in fall and winter.
2. Propleuron-haired. 	2. Propleuron bare. 
3. No tympanic tuft of bristles. 	3. Strong tympanic tuft of bristles at base of calypteres (often seen by lifting upper (alar) calypter with a needle or insect pin). 
Males only	
4. Eyes well separated (frontal stripe broad and parallel-sided). 	4. Eyes almost touching. 
Females only	
5. Dorsum of abdomen usually yellowish at sides, or at least narrowly so toward base, rarely all gray-black.	5. Dorsum of abdomen entirely black in ground color, with strong gray-and-black pattern.
6. Parafrontals often yellowish-tinted anteriorly, posteriorly narrow, each about one-third as wide as median frontal stripe. 	6. Parafrontals (sides of front) bright gray, wide, nearly as wide as median frontal stripe. 

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Cooperative Economic Insect Report, Vol. 9(45): 11-6-59.

Structural Characters for Recognition of Cotton Stem Moth (Platyedra vilella (Zell.))

The following <u>combination of characters</u> will separate the larvae and pupae of Platyedra vilella (Zell.) from those of other species associated with hollyhock and other malvaceous plants. Treatment of the adult has been omitted because characters for ready recognition in the field are not known.

LARVA:

Head - with anterior puncture A_a between anterior setae A_1 and A_2, near A_2.

Prothorax (TI) - with 3 setae on the prespiracular shield.

Abdominal proleg-bearing segments (A_{3-6}) - with seta iv approximate to seta v, both on same pinaculum.

Eighth abdominal segment (A_8) - with group vii composed of 2 setae.

Ninth abdominal segment (A_9) - with seta iii more slender than setae i or ii; seta vi absent.

Crochets (C) - on abdominal prolegs (A_{3-6}) uniordinal in length, arranged in a penellipse.

PUPA: clothed with short, fine, pubescent-like hairs; anterior margins of fore wings (M) contiguous at a point near end of labial palpi, from which they are divergent (never parallel) to apices of wings. Length 8 to 10 mm.

H. W. Capps